

Moberly, Missouri
Water Supply Study
Sugar Creek Lake

Sugar Creek Lake is located about 2 miles North of Moberly in Randolph County. Its drainage area is 11.05 square miles. The lake is in the East Fork Chariton River watershed.

Average annual rainfall for the period 1951 through 2002 is 37.8 inches. Annual rainfall for 1953 through 1957 is 24.9, 34.8, 37.7, 27.9, and 34.0 inches.

Three analysis were made:

1. First run was with the 2001 demand.
2. The lake was analyzed for the optimum daily use without emptying the lake during the evaluation period. The optimum yield from the lake with no additional water added to the system was 1.20 million gallons per day.
3. Additional water that was needed to meet Moberly's needs during the drought of record in the 1950's.

For this analysis actual runoff data from local stream gages was used. Comparisons were made for the Elk Fork Salt River gage, Drainage area is 262 square miles near Paris, and Moniteau Creek gage near Fayette, drainage area 81 square miles. The Elk Creek drainage area shares a common boundary with the Sugar Creek Lake drainage area. Moniteau Creek rises a few miles South of Moberly. Both of these gages yielded similar results. The monthly runoff results were less for these two gages than the USGS regional data. Because proximity of the watersheds and the topography, soils, vegetation and land use in the drainage area of Sugar Creek Lake is similar to the Elk and Moniteau Creeks drainage areas it was elected to use Moniteau Creek for runoff values because the records are the most complete.

Sugar Creek Lake analysis consisted of using the NRCS's computer program "RESOP". This program analyses remaining stored water at the end of each month by summing gains and losses.

Following is the data and procedures for input to the "RESOP" program.

STO-AREA Elevation-Storage and Elevation-Area data were determined from April 6, 2004 survey made by USGS.

<u>Sugar Creek Lake</u>			
Elevation (feet)	Area (acres)	Volume (acre-ft)	
716.0	0.1	0.01	
718.0	11.9	8.1	
720.0	39.1	55.4	
722.0	68.7	163	
724.0	93.8	328	
726.0	117	539	
728.0	141	797	
730.0	164	1,100	
732.0	188	1,460	
734.0	214	1,860	
736.0	230	2,300	
738.0	245	2,780	
740.0	259	3,280	
742.0	279	3,820	
744.0	297	4,400	
746.0	314	5,010	
746.8	320	5,250	Spillway Elevation
746.9	332	5,290	Water Surface in Dec. 2003

LIMITS	<p>Full Pool storage 5250 Ac.Ft. Minimum pool storage 330 Ac.Ft.</p> <p>Starting storage was considered at full pool elevation.</p> <p>The drainage area of the lake is 11.05 square miles.</p>
GENERAL	<p>The adjustment factor of 0.76 to convert from pan evaporation to lake evaporation was applied prior to entering the data for the control word EVAP. As a result a factor of 100 is applied.</p> <p>The record period of drought is in the 1950's. Analysis began in January 1951 and ended December 1959.</p>
SEEPAGE	<p>The reservoir seepage varied from 0 seepage near empty to a maximum of 3.0 inch per month when at full pool. The material in the dam is compacted earth of clayey soils.</p>
RAINFALL	<p>Rainfall data came from the Moberly, Mo. rain gage for the period 1951 through 1959.</p>
RUNOFF	<p>The runoff into the lake from its drainage area. Monthly runoff volumes in watershed Inches were determined for the Moniteau Creek stream gage.</p> <p>In cases where rainfall to runoff values did not appear reasonable, adjustments were made for that month by looking at individual rains and estimating antecedent moisture and then, adjusting runoff based on NRCS's runoff curve numbers.</p>
EVAP.	<p>Pan evaporation at the Lakeside gaging station was used as a base because it has data for year around evaporation. All other stations only measure data between April through November. Lakeside data was updated during these months with gage data from stations at New Franklin, and Columbia. Depending on the latest data for the station nearest to Moberly.</p>
DEMAND	<p>This was determined by city records. The total use in 2001 was 561,159,100 gallons which amounts to 1.537 million gallons per day.</p>

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Storage Volume

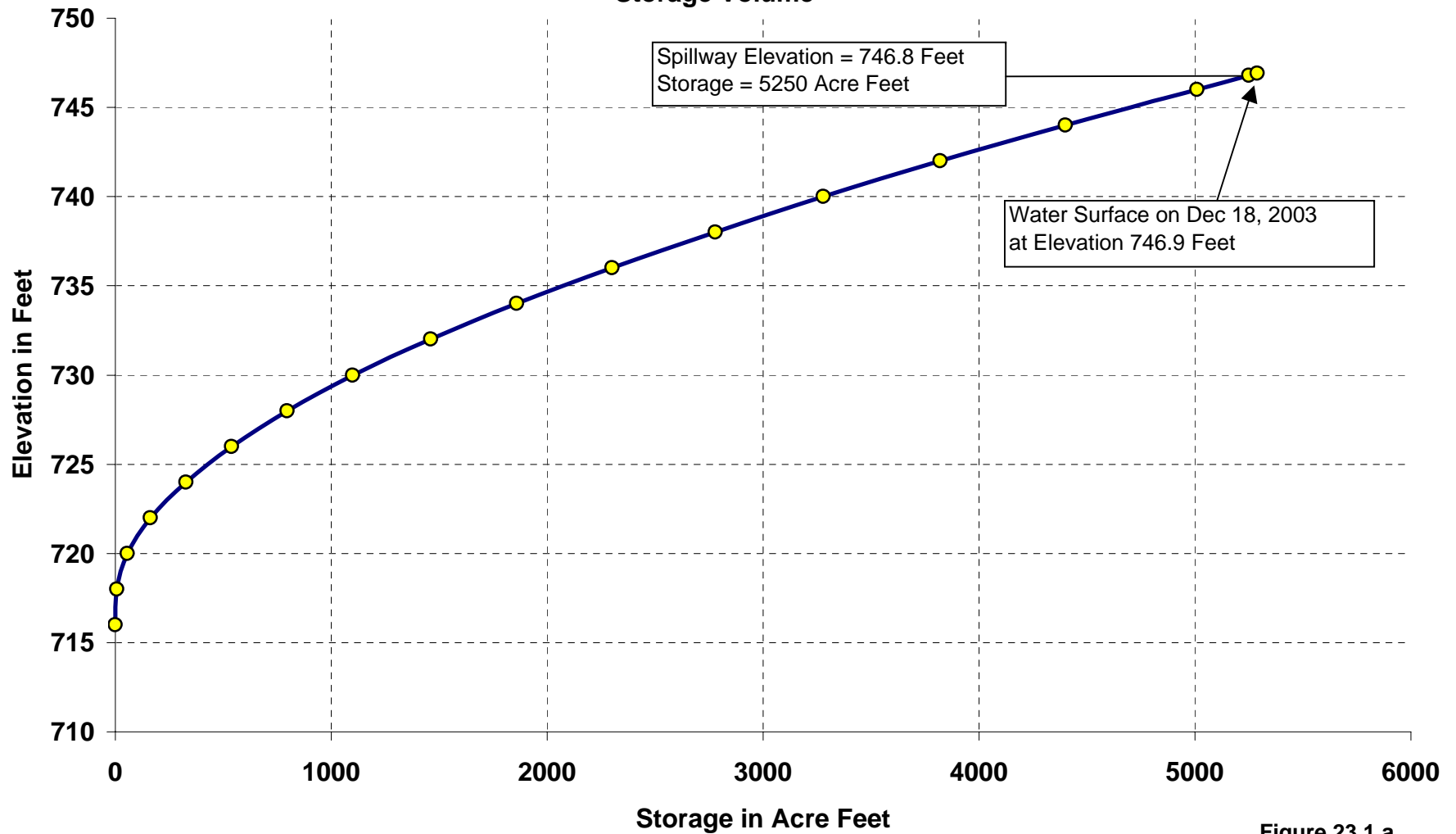


Figure 23.1.a

Moberly, Missouri
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Sugar Creek Lake
Surface Area

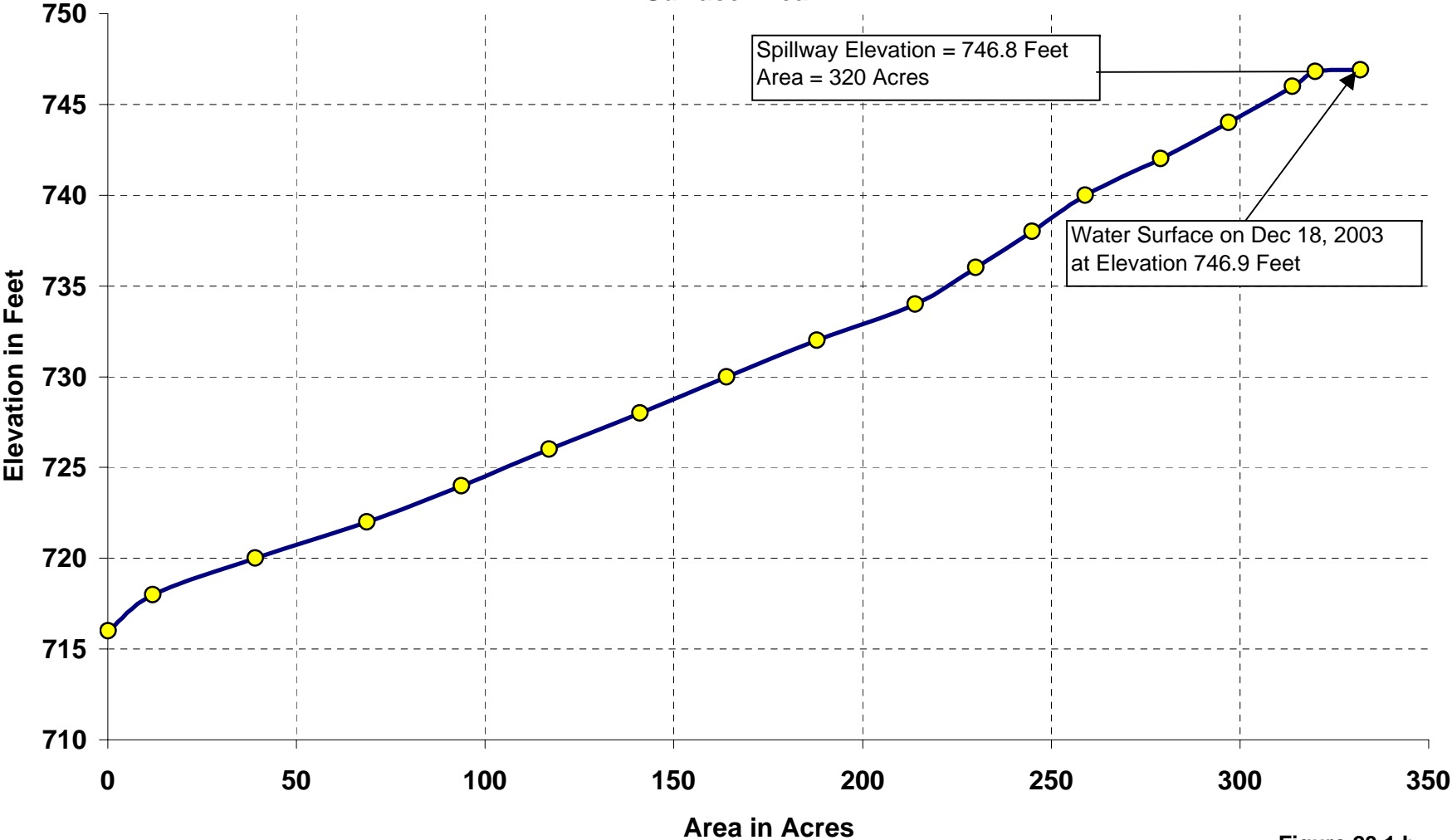


Figure 23.1.b

Moberly, Missouri

Water Supply Study

Sugar Creek Lake

Lake Storage

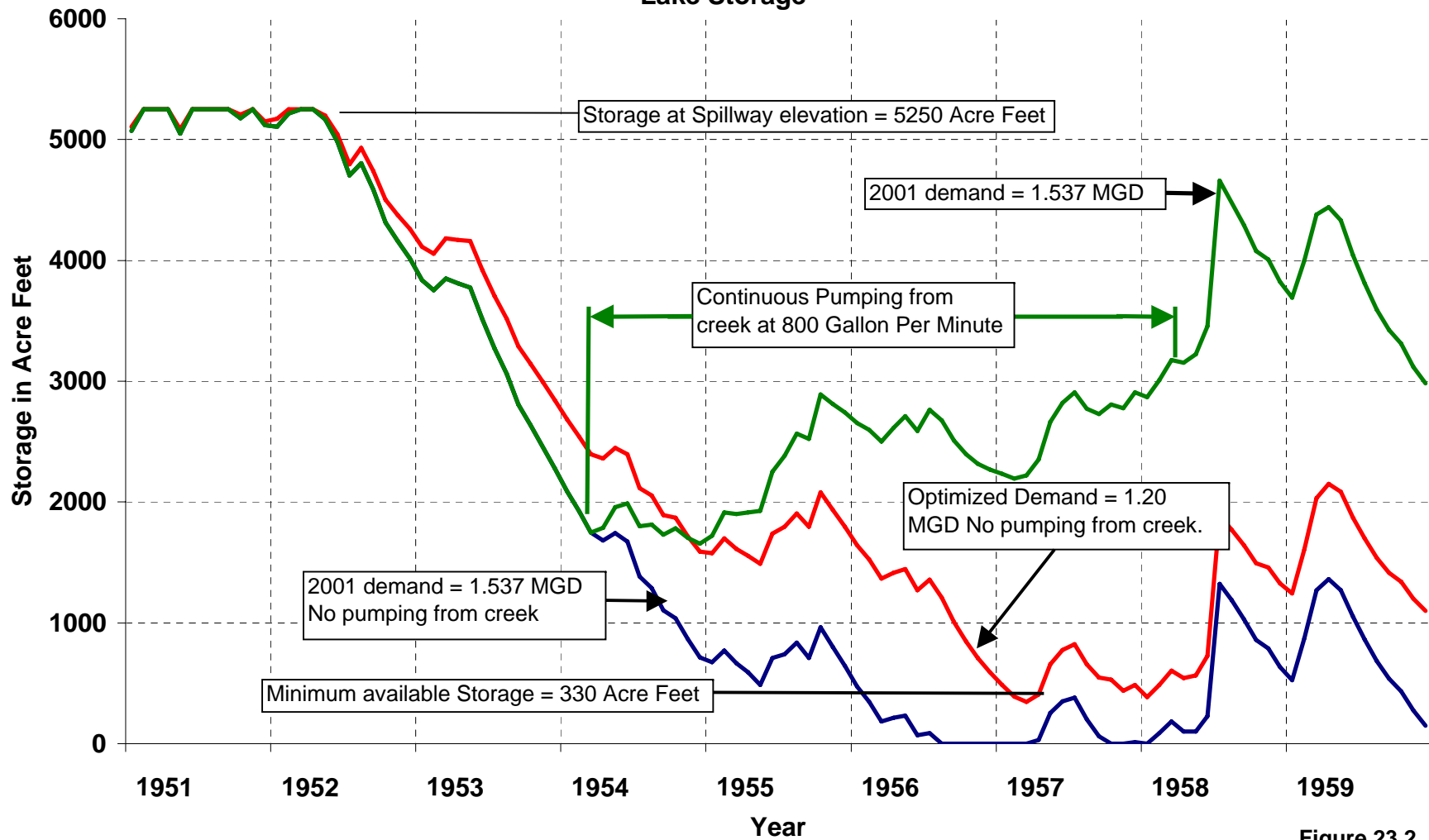
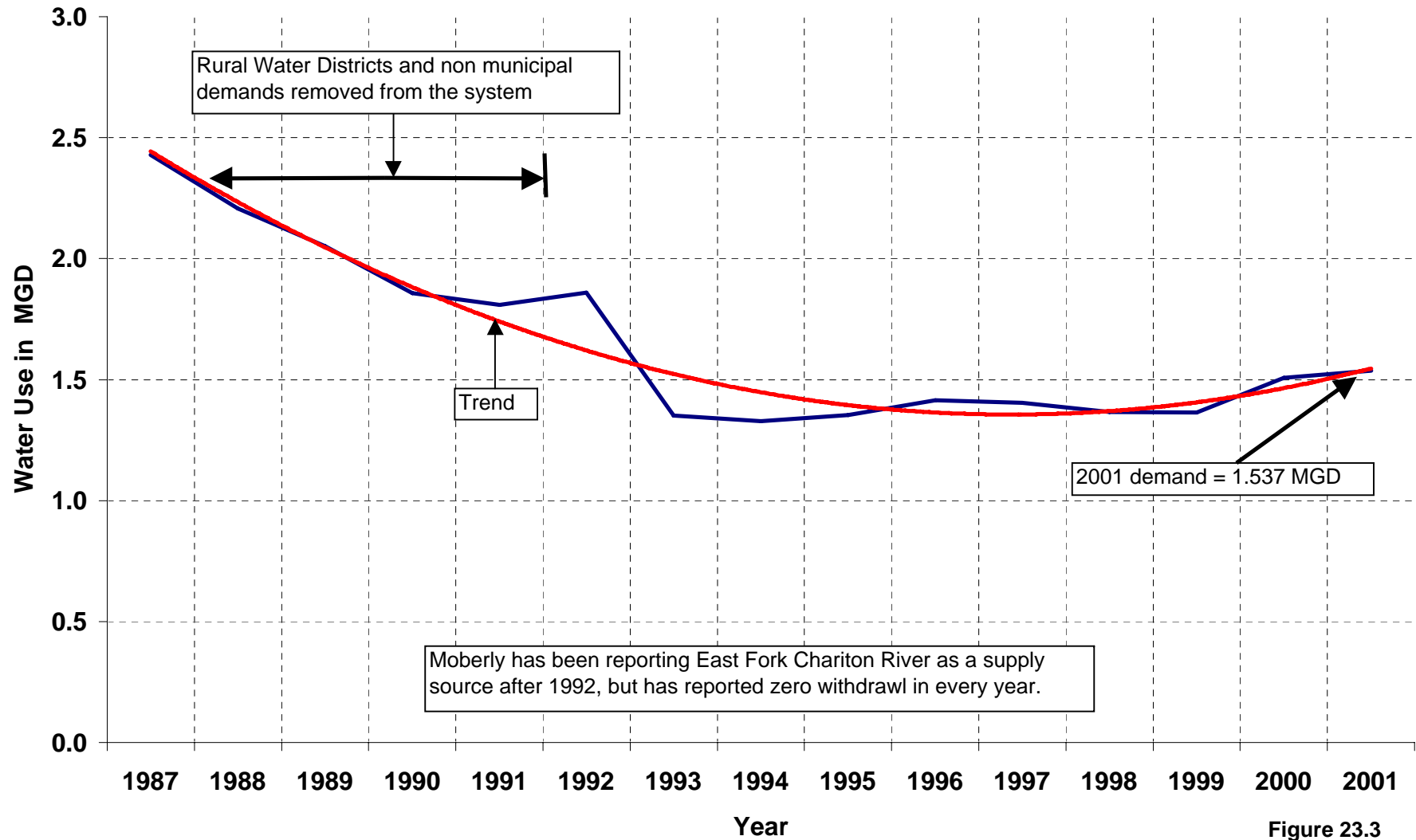


Figure 23.2

Moberly, Missouri

Water Use

Million Gallon Per Day



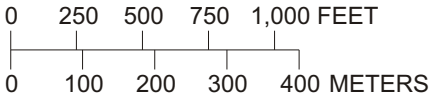
SUGAR CREEK LAKE

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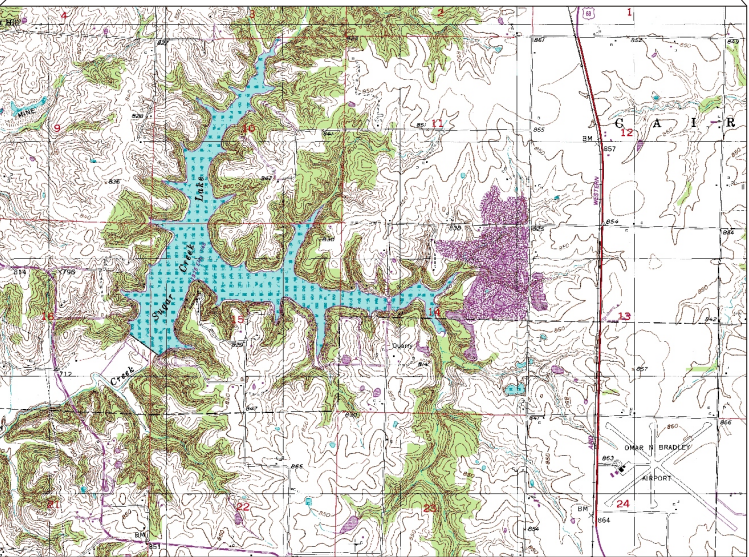
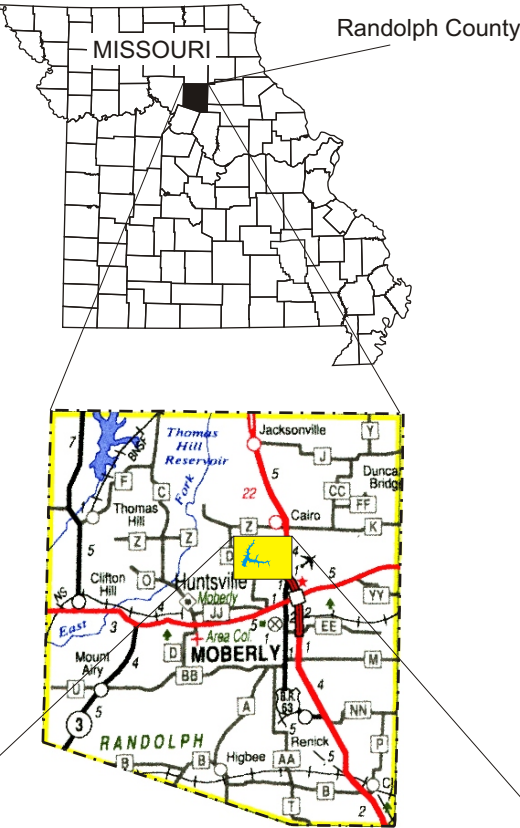
Table 31. Lake elevations and respective surface areas and volumes. Approximate elevation of spillway structure is 746.8 feet. Elevations referenced to North American Vertical Datum 1988 (NAVD 88).
Note: Volumes calculated from surface testing 0.91 feet vertical accuracy at 95 percent confidence level.

EXPLANATION

- 730— BATHYMETRIC CONTOUR—Shows altitude of the reservoir bottom. Contour interval 2 feet. Contours tested 1.51 feet vertical accuracy at 95 percent confidence level.
- 746— WATER SURFACE—Shows approximate elevation of water surface, December 15–18, 30–31, 2003 (mean water-surface elevation during survey period was 746.9 feet, table 31).
- U. S. GEOLOGICAL SURVEY REFERENCE MARKER—Chiseled arrow located on center of walkway above primary spillway. Elevation 755.1 feet.



LOCATION MAP



In cooperation with
Missouri Department
of Natural Resources

Figure 23.4 Bathymetric map and table of areas/volumes of the Sugar Creek Lake near Moberly, Missouri.